NAVAL WAR COLLEGE
Newport, R.I.

AIR POWER PROJECTION IN THE ERA OF "DOUBLE DIGIT" SAMS

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: ____________________

5 February 2001

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Dorothy Grant
Captain, USN

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REPORT DOCUMENTATION PAGE

1. Report Security Classification: UNCLASSIFIED	
2. Security Classification Authority:	
3. Declassification/Downgrading Schedule:	
4. Distribution/Availability of Report: DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.	
5. Name of Performing Organization: JOINT MILITARY OPERATIONS DEPARTMENT	
6. Office Symbol: C	7. Address: NAVAL WAR COLLEGE 686 CUSHING ROAD NEWPORT, RI 02841-1207
8. Title (Include Security Classification): AIR POWER PROJECTION IN THE ERA OF "DOUBLE DIGIT" SAMS (UNCLASSIFIED)	
9. Personal Authors: Commander Walter B. Hudson, USN	
10. Type of Report: FINAL	11. Date of Report: 5 FEB 2001
12. Page Count: 19	12A Paper Advisor (if any): Captain Dorothy Grant, USN
13. Supplementary Notation: A paper submitted to the Faculty of the NWC in partial satisfaction of the requirements of the JMO Department. The contents of this paper reflect my own personal views and are not necessarily endorsed by the NWC or the Department of the Navy.	
14. Ten key words that relate to your paper: Air Power, Power Projection, Command and Control, Surface-to-Air Missiles, Air-to-Surface Missiles, Surface-to-Surface Missiles, Kosovo, Unmanned Aerial Vehicles, Integrated Air Defense System, Suppression of Enemy Air Defense	

15. Abstract:

The United States military has had the advantage of being able to achieve air superiority during armed conflicts over the last 30 years. The ability to access the airspace over adversary territory has become part of the American way of war. Access to foreign hostile airspace in the future will become increasingly difficult. While performance of manned aircraft are reaching their limits, performance characteristics of surface-to-air missiles are still improving. Lessons from recent operations in Kosovo prove that a nation can exercise air denial using inexpensive air defense weaponry.

The ability to exploit enemy airspace will continue to be a necessity in the future. In order to make that possible, we must focus our efforts on sensors and weapons that are more difficult for the enemy to detect and defend against. Unmanned Aerial Vehicles and standoff weapons are well suited to be these enemy airspace exploitation weapons. Joint forces with standoff weapon capability and targeting information provided by UAVs together with a common battlespace picture will have the ability to exploit enemy airspace in the future. The capability exists today; the necessity will exist tomorrow.

16. Distribution / Availability of Abstract:	Unclassified	Same As Rpt	DTIC Users
	X		

17. Abstract Security Classification: UNCLASSIFIED	
18. Name of Responsible Individual: CHAIRMAN, JOINT MILITARY OPERATIONS DEPARTMENT	
19. Telephone: 841-6461	20. Office Symbol: C

Security Classification of This Page Unclassified

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US FIGHTERS SHOT DOWN OVER IRAQ

Two F-15C aircraft were shot down yesterday while enforcing the UN sanctioned "no fly zone" over southern Iraq. It has been confirmed that the aircraft were shot down by Russian made SA-10 surface-to-air missiles. Iraqi envoys responded by saying that the attack was in self-defense and that Iraq will no longer tolerate the violation of its airspace by outsiders. No word is available on the fate of the US pilots.

INTRODUCTION

The scenario described above is fictional of course, however it remains a clear possibility. Consider the possible impact to the decision making of the Commander in Chief, US Central Command (CINCCENT). The operational environment has just changed. It is now fraught with a new risk—the SA-10. Should the "no fly zones" continue to be enforced in the face of this lethal air threat? How many of these systems are operational within Iraqi borders? Do US forces have the capability to suppress this threat? Has Iraq effectively neutralized all air assets in the theater?

In the last 30 years US forces have operated in environments where air assets have been relatively unchallenged in their ability to gain access to desired targets. Nations that have challenged US air power have done so mostly with surface-to-air missile systems (SAMs) and limited use of air-to-air aircraft. To date US forces have faced only first generation Soviet-made surface-to-air equipment and have become quite skilled at suppressing the SA-2, SA-3, and SA-6. However, new generation systems do exist and are far more capable in terms of range and lethality while less susceptible to US suppression of enemy air defense (SEAD) techniques.

This paper will present a concept of operations that will enable a Joint Task Force (JTF) commander to effectively exploit enemy airspace for power projection purposes in the face of newer generation SAMs.

The Surface-to-Air Threat

"Combating the advanced Russian surface-to-air missile (SAM) threat and fielding advanced space capabilities top the list of requirements for Air Force Brig. Gen. Daniel Leaf, the service's director of operational requirements (XOR)."[1] Advanced Russian SAM systems have been in existence throughout the past decade. Dubbed "double-digit" SAMs because of their NATO designations (SA-10, SA-11, SA-12, SA-13, etc.), these systems offer much improved capability over the older generation systems. By mid-1999, Russian military equipment manufacturers had put the finishing touches on the latest SA-10 "GRUMBLE" family of SAM systems which will surely create major problems for SEAD planners in the years to come and will be a major market leader for those countries not willing to deal with Western air defence system suppliers.[2] The SAM systems are designed to be complementary, fully mobile and to utilize fully all the latest equipment and Electronic Counter Counter Measure (ECCM) techniques.[3] Emphasis here has been placed on the SA-10 family because it represents an emerging challenge with long range/high altitude area denial capability.

Depending on the model, the SA-10 has an effective maximum range of between 29 and 95 miles up to an altitude of 100,00 feet.[4] SA-10 systems pose a significant problem for current US air power projection ability. The deployment of advanced SAMs over the past decade has been slowed due to the collapse of the Soviet Union and additionally hampered by arms embargoes against several major Soviet export clients such as Iraq and Libya.[5]

However, SA-10 systems are in service with Belarus, Bulgaria, China, Croatia, Cyprus, Hungary, India, Iran, Russia, Slovakia and Ukraine.[6] "Although not publicly stated, it is highly likely that Russian development plans include long-range weapon equivalent to China's FT-2000 passive anti-radiation missile designed for use against electronic radiation emitting AWACS/J-STAR/EW/ELINT type aircraft already in service."[7] Russian exports in the future are almost certain to expand as they bolster economic fortunes.

In addition to the long-range/high-altitude system threat, short-range systems continue to be developed with emerging passive capabilities and increased lethality. For instance the SA-13 is being outfitted with an improved all-aspects infra-red seeker unit, which operates in two individual frequency bands to give high discrimination against infra-red (IR) countermeasures such as flares and decoy pods.[8] Frequency agile radars and optronic systems are being developed that will be increasingly difficult to overcome.

The bottom line in SAM development is that increases in range and lethality are going to change the fundamental way air power projection is accomplished by US forces. In the most recent effort to apply air power in Kosovo, a modest air defense system forced US/NATO aircraft to operate at higher altitudes to avoid the missile/anti-aircraft artillery (AAA) threat. "The lesson from this campaign for armies likely to face NATO or US air power is that investment in relatively inexpensive, new-generation IR-guided SAMs is the most cost effective solution for tactical air defense."[9] The successful effort at air denial by the Serbs is likely to be expanded to include higher altitudes by future foes. Despite the shootdown of an F-117 stealth fighter, the most important lesson for the US should not be that the radar-directed SAM threat can comfortably be ignored. There have never been any air operations carried out against an opponent defended with a missile system using contemporary radar

missile guidance.[10] A JTF commander who intends to employ air power over a hostile nation may quickly realize that enemy SAMs prevent US forces from establishing air superiority. Future operational planning will have to consider ways to deal with these newer generation SAMS.

JTF Commander Considerations

Future power projection over a hostile nation with a robust integrated air defense system (IADS) will prove a difficult task. "A variety of considerations portend a more sparsely populated battlespace. While generally supportive of recent military operations, the public is increasingly adverse to the risk of casualties and prefers to substitute technology for lives."[11] As *Joint Vision 2010* makes clear, "the American people will continue to expect us to win in any engagement, but they will also expect us to be more efficient in protecting lives and resources." In addition, recent operations have included the need to reduce civilian casualties. The need to exploit the airspace over hostile territory will continue to be a requirement. The way in which this exploitation is accomplished will necessarily undergo some changes.

The current extensive effort to penetrate an enemy IADS highlights that manned airborne weapon systems are reaching the limits of their capability. "Every weapon system (or general culture of weapons) has a life cycle that begins with the simple purity of the offensive and culminates in a weapon system overwhelmed by its own defensive measures."[12] SEAD packages that accompany strike missions today include almost as many aircraft as the strikers themselves. Defensive systems for tactical aircraft including chaff, flares, expendable decoys, towed decoys and laser counter measure equipment are becoming driving factors in overall aircraft weight and payload capability. The effort to get the aircraft

into the target area and then safely back has begun to overshadow the fact that it is only carrying a few bombs.

Protecting forces from enemy fire is not the only hazard encountered when conducting offensive operations. In Operation Desert Storm fratricide accounted for a reported 17 percent of allied military casualities.[13] There are ongoing efforts designed to reduce fratricide in the future. The All Service Combat Identification Evaluation Team (ASCIET) conducts an annual exercise to address this problem, supporting the assessment that Combat Identification (CID) is an extremely difficult task. When in a combat zone, friendly and hostile aircraft limit emissions to prevent being targeted. This in turn limits friendly ability to track friendly aircraft and once engaged with the enemy it becomes even more difficult task to sort the friendly from the hostile. Add a few neutral aircraft into the equation and the problem intensifies. Eight years after Desert Storm CID remains a very real problem; results from ASCIET 99 show that fratricides still occurred in about 15 percent of the tests.[14]

The effort to establish protective measures for power projection aircraft has become a burdensome task whose mission will grow in complexity and difficulty with the introduction of new generation SAMs. With force protection and reduced civilian casualties the political constraints for future operations, the JTF commander will have to rely on a new method to exploit enemy airspace. The new method (using capabilities that exist today) can employ stealth sensors and standoff weapons with precision strike capability. Sensors will have to penetrate enemy airspace undetected as well as provide targeting information for standoff weapons. Standoff weapons will have to be employed from long range (100 NM or greater) and have precision strike capability. Short range "standoff" capability (~10 NM) that exists today with air dropped weapons will do little good against a 95NM SAM.

UAVs and Standoff Weapons

Long range cruise missiles such as the Tomahawk Land Attack Missile (TLAM) and Conventional Air Launched Cruise Missile (CALCM) are capable assets for known/fixed targets. However, a more agile system for air strike is required for unknown or mobile targets. In a hostile air environment the sensors will be required to dwell over suspected target area for extended periods and therefore will require low observable characteristics. Because they are smaller (lower radar cross section/reduced IR signature), have extended endurance, and keep operators out of harm's way, Unmanned Aerial Vehicles (UAVs) are best suited to conduct the sensor operation.

Current UAVs employ day/night and all weather sensors (electro-optical, infrared, and synthetic aperture radar) and can operate for extended periods up to 20 hours. They can provide continuous imagery via satellite data-link to any element in the chain of command from tactical operators to the Joint Force Commander (JFC). These sensors provide missions to include precision targeting, reconnaissance, intelligence collection, and battle damage assessment. The precision targeting capability bears directly on the operational commander's ability to project power in the face of sophisticated enemy air defense systems.

Real-time targeting information that can be directed to a standoff weapon will enable precision engagement without putting the operators in harm's way. A sample of current and near term capability in standoff weapons include: the sea-based Land Attack Standard Missile (150 miles) and Extended Range Gun Munitions (~100 miles), the land-based Army Tactical Missile Systems (186 miles), and air-launched Joint Air-to-Surface Standoff Missile (~200 miles) and Standoff Land Attack Missile Expanded Response (~200 miles). The method of employment calls for UAVs providing surveillance and targeting data to the

commander. The commander then selects the best standoff weapon. The standoff weapon will be sent targeting information from the UAV and then be fired at the target. If a unitary warhead is required for penetration or to minimize collateral damage, the UAV can provide laser designation for a laser seeker head on the standoff weapon; otherwise cluster munitions can be used with targeting data only. Note that in the process, the commander has just solved his force protection requirement and has the opportunity to employ precision weapons.

During the Kosovo operation UAVs detected targets of interest but there was no system in place to pass that information directly to the weapon controller.[15] This link between the sensor and shooter is essential for effective operations. The US Air Force is currently in the process of equipping UAVs with laser designators to reduce the exposure of personnel to hostile ground fire while speeding up the ability to attack targets of opportunity.[16] The capability to interdict mobile targets and conduct strategic strikes is well thus within the realm of capability. The key to developing this capability is to ensure that sensor data is properly disseminated not only to the shooter but, also to the decision making center of the operational force. (Note: An easy solution to linking sensor to shooter data would be to arm the sensor. However, because the 1988 Intermediate-range Nuclear Forces (INF) treaty bars "an unmanned, self-propelled vehicle that sustains flight through the use of aerodynamic lift over most of its flight path" and has a demonstrated capability to deliver weapons, the Pentagon has been reluctant to press with arming UAVs.)[17]

Command and Control

In order for the commander to employ UAVs and standoff weapons effectively, he must be able to attain an accurate picture of the battlespace. The key will be to generate a Single Integrated Air Picture (SIAP). The SIAP refers to a future display of friendly, neutral and

enemy aircraft and weapons that would appear on battlefield commanders' computers as a result of fused, or integrated, tracking data coming in from all of the available sensor platforms in the theater.[18] Developing the SIAP is a critical component of missile defense and other missions.[19] The operational commander will be able to establish the defensive boundary and then use the SIAP for power projection purposes.

The component systems and sensor platforms to produce a SIAP exist today, although their output data is not fused into a single product and identification capability is limited. Ground radar (shore and ship based), airborne radar, and airborne Signals Intelligence (SIGINT) platforms can share information via the Joint Tactical Information Distribution System (JTIDS). In addition, the Navy is developing the Cooperative Engagement Capability (CEC) in which shared track data can be used for weapon system employment.

With the SIAP, the commander would have a clearer idea of the exact nature of the battlespace. Combining the SIAP with UAV information would enable the commander to "see" the location of friendly assets in relation to proposed targets and be able to direct sensors to areas of interest, select the best weapons employment system, and assess the weapons effectiveness through imagery. Current efforts to produce an air picture fall short of incorporating all assets and are poor at solving the CID problem. Some type of air picture is required to ensure targets are within standoff capability and current efforts meet this requirement. With the establishment of an air picture and a concept of how weapons are going to be employed, the focus move to airspace control.

The current Joint Publication addressing combat zone airspace lays out considerations for airspace control and airspace designation.[20] These considerations include and define 29 separate classifications for airspace. The Airspace Control Plan (ACP) will always have to

take into account host-nation and multinational political constraints, capabilities and procedures of military and civil air traffic control systems. But, when the additional 29 airspace measures are required to safely manage the multitude of aircraft that are required to work the battle space, the complexity increases considerably.

A JTF commander who can conduct interdiction and strategic strike missions with UAVs and standoff weapons using a SIAP will not need a complex ACP. The initial benefit is that there will be far fewer aircraft actually using the airspace. Current procedures that call for Suppression of Enemy Air Defenses (SEAD), Offensive Counter Air (OCA), Defensive Counter Air (DCA), Airborne Command Control and Communications (ABCCC), and in-flight refueling will not be required. Return to Force (RTF) procedures will be simplified as well because there are fewer aircraft returning. Airspace control measures will only be required for the airborne sensor platforms producing the SIAP and airborne standoff weapons shooters.

The simplified battlespace environment will aid in the effort to produce the SIAP. CID will be an easier task because friendly tracks (except UAVs) are not entering hostile airspace. The simplified nature of the battlespace will enable the JTF commander to reshape the command relationships.

The SIAP will have to be sent to all standoff weapons shooters to include land, sea and air forces. This highlights again why the SIAP is so important. When all of the theater assets are working with the same information, there will be no need for individual land, maritime, and air component commanders. Command relationships would be better served through objective-oriented commanders. A close combat commander, fires support commander

(including airborne sensor control), and logistic support commander will then be able to replace the previous three (land, sea, and air components) and be better oriented for tasking.[21]

The fires support commander could use real-time targeting data to decide which fires support platform was best suited for the mission, then call for immediate fires. When engaged in close combat operations, the fires support commander would be the supporting commander for the close combat commander with the ability to employ all of the standoff platforms as necessary. A close working relationship will necessarily exist between the close combat commander and the fires support commander to coordinate fires in close proximity to the Fire Support Coordination Line. Because shared assets are being used for both deep and close fires, the coordination should be self-synchronizing. The ability to effectively manage all land, sea, and air assets (standoff shooters) will enable the fires support commander to mass effects where and when they are needed. Again, this concept of operations is reliant upon an accurate SIAP to enable the real-time management of assets.

JTF Effectiveness

The method of operations described above offers many advantages. JTF requirements for force protection are served well because no friendly forces are crossing hostile lines. This also reduces the need to conduct Combat Search and Rescue (CSAR). Precision weapons are employed to reduce collateral damages. The reduced requirement for combat aircraft produces a less crowded battlespace. This, in turn, makes the combat identification effort much easier and therefore reduces the possibility of fratricide. The addition of UAVs that have enough stealth to remain undetected and on station for extended periods greatly enhances the commander's capability to collect intelligence. In addition, current efforts at Battle Damage Assessment (BDA) are poor at best and will be further enhanced with an

Intelligence, Surveillance and Reconnaissance asset that can record the strike and remain in the target area after the attack to give accurate BDA information.

The simplified command structure supports a hierarchy of task-oriented commanders. A task-oriented fires support commander would be positioned to draw together capabilities of all standoff weapon assets in the theater because they are all capable of supporting the mission for his assigned task. In addition, the time to engage a target would be reduced considerably from current standards (real-time imagery to shooter vs. imagery to targeting cell to next day Air Tasking Order). The targeting cell could establish priorities and drive the imagery production effort including real-time targeting information capable of immediate action. The JTF commander will have a less complicated air picture and more directed command structure to concentrate on strategic objectives.

Drawbacks

The biggest drawback in this proposal is that not all of the capability exists today. Although UAV/standoff individual capability exists, the link between the sensor and shooter is not in place. The SIAP is still in work. Link capability does exist among sensors and command centers, however there are interoperability issues between air/naval assets and Patriot systems. In addition, the CID capability does not exist. The SIAP is a long way off in terms of CID, however a single air picture is available now and UAV/standoff weapon links are in development.

The advantages gained with respect to fewer combat aircraft are only applicable to situations where the enemy air defense systems preclude the use of manned aircraft. Today the opportunity to use UAVs exist where "no fly zones" have been designated or in actual combat operations. The use of multiple stealth UAVs during peace operations would create

collision avoidance ("see and avoid") problems for neutral/friendly air traffic. Current Federal Aviation Administration rules restrict UAV operation except under very controlled circumstances (i.e. chase aircraft or ground observer). Therefore, for operations other that actual combat, manned systems will still be used.

Current operational UAVs are not completely stealthy to radar. Typically they do not provide a good radar track, however UAVs were shot down over Kosovo by SAMs and thus are susceptible to attack. Tactics for employing them must take into account the air defense capability of the hostile state. Although not currently operational, UAV production efforts are underway which include stealth as a major design factor. In fact, there are existing units that incorporate stealth technology with micro technology producing extremely small prototypes (6 inch wingspan) that can process and deliver the same intelligence information as the current larger operational models. The point here is not to advocate a force planning issue, but to point out that the ability to field UAVs that are more survivable does exist.

Weather is still a limiting factor to the employment of UAVs. Limitations that currently apply to manned aircraft will not be significantly improved by the capabilities currently available. Electro-optical sensors, IR seekers, and laser designators still have the same limitations. UAV operating altitudes typically preclude lower altitudes, therefore no advantage is gained.

The automated nature of these proposed operations also creates a contentious issue. Moral considerations for conducting military operations from a "push button" concept may spark negative reactions within the public and non-governmental organizations. The use of such weapons to obtain strategic objectives will continue to pose the same problems that strategic bombing has always posed. Pinprick strikes used to coerce the leadership of a hostile nation

to do our will may only galvanize the population against us. Compared to the use of nuclear missiles, this system comes as close as any military capability in use today where forces can apply significant destruction without subjecting themselves to danger.

Conclusion

The development of SAMs will continue to produce more sophisticated and lethal capability. The proliferation of these systems is sure to make their existence an increased planning factor for any operational commander in the future. US tactics for SEAD are well known from years of implementation and just as our system improvements come on line, countering systems will be developed. In order to exercise air power to equivalent effect as in the past, we are employing more and more defensive measures. Future uses of air power projection will necessarily require two aspects: force protection and limited civilian casualties. To meet these requirements our capabilities will have to meet two criteria: standoff ability and precision weapons. These two criteria are at odds with each other. The more standoff that is obtained the more difficult the precision capability becomes. Therefore the advantages brought by technology in the form of UAVs and standoff weapons can offer a solution to this problem. Continued use of past concepts of air power projection may prove to be too difficult or costly to implement.

The near future will certainly challenge an operational commander who has been given operational objectives that require application of force across hostile borders. The capabilities offered by a combination of UAVs and standoff weapons give that commander the opportunity to employ military force given modern constraints.

The drawbacks listed above will be overcome in time. Interoperability issues between service specific systems are certainly a reality in the near future as is the issue of establishing

a sensor to shooter information link. Developing a SIAP with CID capability may be the most difficult problem to overcome, however if we simplify the air space the effort will be much easier. Use of UAVs in foreign and domestic air space should become more and more acceptable with the use of Terminal Collision Avoidance Systems (TCAS) and follow on systems. The weather issue should be overcome as UAVs develop more stealth and are able to operate at lower altitudes.

For a long time the US military has benefited from the ability to exploit the air space over hostile countries. Our capabilities have managed to stay one step ahead of the defensive capabilities of the adversary. However, that time is coming where we are going to have to establish new methods to obtain our objectives. In the future air power projection will require more detailed and timely intelligence combined with the ability to attack from a safe distance. The capabilities that exist today can be refined for the near future to produce the ability to conduct air power projection in a modern hostile environment.

Solution

To answer the problem posed at the beginning of the paper to CINCCENT, I would establish an air picture with the SIGINT and radar aircraft available in Saudi Arabia, then deploy UAVs to the suspected areas where SA-10 sites exist. I would then launch several Miniature Air Launched Decoys (MALDs) into the area from standoff ranges. When the SA-10 systems fire their weapons, use the airborne platforms (both UAVs in country and others from standoff ranges) to target the launch sites. Once the SA-10 sites were targeted, I would relay the information to airborne weapon shooters with Joint Air-to-Surface Standoff Missiles and attack the launch sites. Although not completely assured of locating the launchers, it would be better to have to try again rather than to conduct a follow on Combat Search and Rescue mission.

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